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the liberality of our government in causing these explorations to be carried out, and in placing the results directly before the people. We shall return to this report in a subsequent number of this journal, and notice the results contributed by Prof. Hayden's collaborators.

After all, the discoveries here published are the results of but a slight reconnoissance, and we trust that this is but the beginning of a long series of annual explorations, so that the outlines here sketched may be filled in with a completeness worthy of the subject.

ELEMENTS OF PHYSICAL MANIPULATION.*—This book would, perhaps, have never seen the light, or even been conceived of in the olden time of endeavoring to instruct students by talking at them from behind a formidable array of retorts, balances and batteries. By the new method the student is invited into the laboratory, and initiated into the use of the apparatus, of old so mysterious and awe-inspiring to the beginner. The tools of the physicist and chemist are now explained and their use illustrated; and, equipped with a knowledge of manipulation, the learner needs little urging to apply his information.

This text book of physical manipulation seems admirably adapted to aid the teacher in work of this kind, and for those who have not the advantages of competent laboratory instruction it seems to us that it must prove invaluable. It is also admirably designed as an introduction to the ordinary text books.

Judging by the portion relating to the use of the microscope, the style is exact and clear. The spectroscope, both solar and chemical, is described, and experiments in its use given. So for the microscope. The instrument is described, and experiments illustrating its use given, also an account of the diaphragm, oblique illumination, the study of opaque objects, the lieberkuhn, Wenham's parabolic condenser, the achromatic condenser, the polariscope, binocular, Maltwood's finder, micrometer, goniometer, camera lucida, spectrum microscope, and test objects, together with concise directions for the preparation and mounting of objects, and directions for measuring the focal length of an objective.

Prof. Pickering claims that among the experiments, several that are new, with new apparatus, such as that for ruling scales, the

* *Elements of Physical Manipulation.* By Edward C. Pickering. New York. Hurd and Houghton. 1873. 8vo. pp. 225. \$3.00.

photometer and the polarimeter, are for the first time described in this book. The typographical appearance of the book is most inviting, and we trust that the second volume, relating to heat, electricity and other subjects interesting to the student of physics, will soon appear.

THE SPECTROSCOPE.*—The time is perhaps coming when the scientific world will be divided into two classes, *i.e.*, those who carry a microscope, and those who carry a spectroscope in their vest pockets. For what biologist can do without his microscope, or physicist without his spectroscope? This little manual tells us what the spectroscope is, and how it has been applied in discoveries that have transcended the wildest dreams of philosophers. Mr. Lockyer tells the story with such perspicacity and interest that though we had intended to simply glance through its chapters, we have not failed to read every word of it. Admirably clear and comprehensive in style, it is beautifully illustrated and very attractive in typography. It is the first of a library of scientific manuals to be published by Messrs. Macmillan & Co., under the title of "Nature Series."

BOTANY.

SENSITIVENESS OF THE LEAVES OF *DIONÆA* AND *DROSERA*.—At the recent meeting of the British Association for the Advancement of Science Dr. Burdon Sanderson read a paper on the electrical phenomena which accompany the contractions of the leaf of *Dionæa muscipula*. The contraction of certain organs of some plants on irritation, such as the leaves of *Drosera* and *Dionæa*, especially the latter, strikingly suggest a correspondence of function between them and the motor organs or nervous system of animals. A careful series of experiments made by means of Sir W. Thomson's galvanometer, fully confirmed the hypothesis of the existence of voltaic currents in these parts; the currents being subject, in all respects in which they have as yet been investigated, to the same laws as those of muscle and nerve. At the same meeting a paper was also read by Mr. A. W. Bennett on the movements of the glands of *Drosera*. These glands, which fringe the margin of its

*The Spectroscope and its Applications. By J. Norman Lockyer. With colored plate and illustrations. Nature Series. London and New York, Macmillan & Co., 1873. 12mo pp. 117.